# EFFECT OF RECOVERY DRINK ON THE RECOVERY PATTERN IN RACE WALKERS

A SYNOPSIS

Submitted in partial fulfilment of the requirement of the degree of

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**CERTIFICATE**

I hereby declare that the synopsis "Effect of recovery drink on the recovery pattern in race walkers" being submitted in partial fulfillment of the requirement for the degree of Doctor of Philosophy in Physical Education under the Physical Education Pedagogy department of Lakshmibai National Institute of Physical Education, Gwalior (M.P.) during the academic year 2021-2022. It is a bona fide record of original work carried out under the supervision of Dr. Dilip Tirkey. It has not been submitted in whole or in part to any other university or institution for a degree or diploma.

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## ABSTRACT

The present study investigates the impact of a carbohydrate-protein-based recovery drink on various recovery parameters of national-level race walkers. Given the demanding nature of race walking, optimal recovery is essential to maintain performance, reduce fatigue, and prevent injury. Recovery nutrition plays a crucial role in replenishing glycogen stores, repairing muscle tissue, rehydrating the body, and supporting immune function. This research aims to determine whether a specifically formulated recovery drink can significantly enhance recovery in comparison to conventional hydration (water only).

A sample of national-level race walkers aged 16–30 years was selected for the study. A crossover design was implemented, with physiological and perceptual recovery variables measured under two conditions: one with only water post-exercise and another with a recovery drink. The dependent variables included blood lactate, blood glucose, lactate dehydrogenase (LDH), heart rate, rating of perceived exertion (RPE), and Quality of sleep. Testing was conducted at pre-defined intervals: pre-event, and at 15, 30, and 45 minutes post-exercise. lactate dehydrogenase (LDH), Sleep and exertion scores were assessed post-session.

The statistical techniques used include descriptive statistics (mean and standard deviation), one-way repeated measures ANOVA for physiological variables, and paired sample t-tests for perceptual variables. The outcomes of this study are expected to provide evidence-based recommendations on the use of recovery drinks to enhance post-exercise recovery in race walkers and help coaches determine the optimal carbohydrate-to-protein ratio and dosage relative to body weight.

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# Chapter- I

# INTRODUCTION

## "YOU ARE WHEN YOU EAT: TIMING IS EVERYTHING"

The importance of recovery nutrition depends on the type and duration of exercise just completed, body composition goals and personal preferences. The goals of the recovery nutrition are to:

- Appropriately refuel and rehydrate the body
- Promote muscle repair and growth
- Boost adaptation from the training session
- Support immune function

Proactive recovery nutrition is especially important if you complete two or more training sessions in one day or two sessions in close succession (e.g. evening session followed by early morning session the next day). However, if you're exercising once a day or a couple of times a week, recovery nutrition is still important but you may be able to meet your nutrition goals from your usual meals or snacks rather than adding in extra food.

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a week, recovery nutrition is still important but you may be able to meet your nutrition goals from your usual meals or snacks than adding in extra food.

There are three golden rules in recovery nutrition-

- Refuel muscle glycogen (carbohydrates stores)
- Repair muscle (for proper functioning and development)
- Rehydrate (replace fluids lost through sweat)

In race walks, technique is imperative, so athletes need to maintain a high level of concentration throughout the event. Dehydration can impair concentration and overall performance. It also increases body temperature and heart rate, increasing perception of fatigue. Fluid needs can vary depending on body size, gender, the weather, fitness and intensity of the exercise so a general fluid guide is difficult. The aim is to start any exercise session or competition well hydrated. This requires drinking regularly throughout the day leading up to training or competition. Having a drink with all meals and snacks is a good start. During the walk, fluid should be taken regularly with sports drinks or electrolyte replacement considered in the lead up to, and during the event to ensures walkers are adequately hydrated. While hydration levels are important, it is also important to avoid over-hydrating which can occur more often in less trained walkers. Understanding your individual sweat losses and hydration needs is important for developing an individualised hydration plan

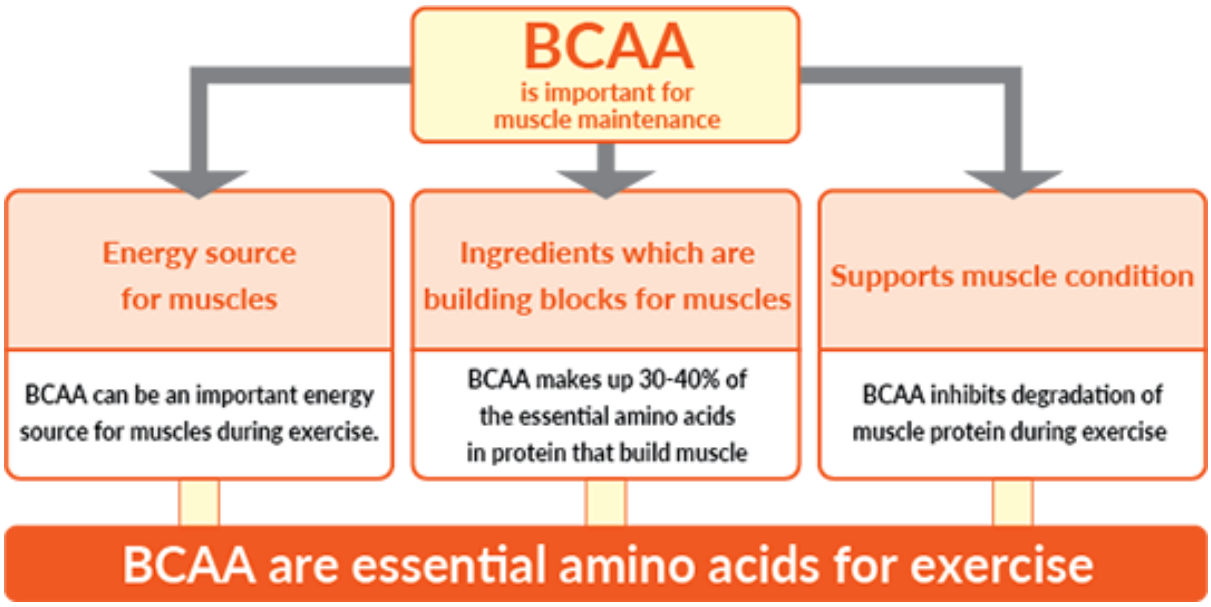
Fatigue is largely caused by an imbalance of energy, carbohydrate, protein and fat. Unless addressing a specific deficiency (e.g. iron), supplements will do little to reverse the problem. A broad spectrum multivitamin and mineral may be useful for athletes who are travelling and can't eat their normal meals. Elite athletes with a heavy competition schedule and disrupted meals may also benefit from a broad spectrum multivitamin and mineral supplement to 'top up' dietary intake.

The proteins that compose the human body are made of 20 different amino acids (9 essential amino acids + 11 non-essential amino acids). The function and shape of each protein varies depending on the number, type, and combination order of its amino acids. All 20 amino acids are needed to build the body, but essential amino acids cannot be synthesized in the body and must be acquired from food. The essential amino acids that are converted to energy in the

muscles are valine, leucine, and isoleucine, and the general name for these 3 is “BCAAs (Branched Chain Amino Acids).”

The body uses amino acids to make proteins, which are the building blocks of every cell, tissue, and organ. Amino acids and proteins also play a crucial role in metabolism.

There are 20 amino acids, of which nine are essential. The body cannot make essential amino acids, so a person needs to get them from their diet.


BCAA
is important for
muscle maintenance
Energy source
for muscles
BCAA can be an important energy source for muscles during exercise.
Ingredients which are
building blocks for muscles
BCAA makes up 30-40% of the essential amino acids in protein that build muscle
Supports muscle condition
BCAA inhibits degradation of muscle protein during exercise
BCAA are essential amino acids for exercise

A recovery drink is a fluid that an athlete ingests after a workout in order to speed his or her recovery from the workout. There are different types of recovery drinks that sports scientists have developed to help in the recovery from a variety of workouts. Regardless of the type of workout, though, a recovery drink always aims to accomplish some combination of two primary goals: to replenish nutrients that the body loses during the exercise and to provide the necessary nutrients for the body to get the greatest possible benefit from the exercise.

Many runners consume sports drink to replace the electrolytes they sweat out.

Recovery drinks are different from energy drinks because the athlete will ingest a recovery drink after exercising rather than before exercising. Sports scientists design energy drinks to

provide athletes with the nutrients necessary to perform an exercise at the optimal level. A recovery drink, though, emphasizes providing the body with the means to minimize the fatigue and muscle soreness that exercise can cause, usually so that the athlete will be able to return to physical activity sooner than he or she otherwise would.

There are different types of recovery drinks that can be used, depending on the type of activity that the athlete performs. An endurance athlete, for instance, generally will use a recovery drink that replenishes the electrolytes and carbohydrates that he or she loses during extended aerobic exercise. When an athlete works out for an extended period of time, he or she loses several vitamins and minerals because of sweating and burns a large amount of energy in the form of carbohydrates. In order to recover from such activity, then, it is important to find a recovery drink that will supply the body with these necessary nutrients.

In order to minimise this process, then, an athlete should chose a recovery drink that provides a large concentration of both carbohydrates and protein. When the body does not have enough carbohydrates, it begins to consume proteins, and it is this protein consumption that, in part, causes the muscles to break down. The carbohydrates in a recovery drink will give the muscles the energy they need to function without the need to burn extra proteins. Meanwhile, the protein in the sports drink will provide the body with the nutrients it needs to repair the muscles and to produce new muscle tissue.

## STATEMENT OF THE PROBLEM

“Effect of recovery drink on the recovery pattern in race walkers”, stating that there is a gap between how suitable the recovery drink is in the recovery of race walkers after completing their task.

## OBJECTIVES OF THE STUDY

- The present study will help in knowing whether the recovery drink will be helpful or not in recovering from the event, i.e. race walking.
- The present study will help the coaches in understanding the correct ratio of carbohydrates and protein amount given to race walkers with the help of a recovery drink.
- This study is going to add what amount of protein per kg of body weight protein is necessary for recovery from race walking events or any other

## DELIMITATIONS OF THE STUDY

- The study is going to be delimited to the race walkers only.
- The study is delimited to the National level participants.
- The study is going to see the effect of the "recovery drink" only.
- The study is going to be delimited to the race walkers of the age range between 16-30 years.
- The study is delimited to only these variables as Blood lactate, Blood glucose, Lactate dehydrogenase, Rating of perceived exertion, Heart rate and Quality of Sleep.

## LIMITATIONS OF THE STUDY

- Any nutritional value taken by an athlete can make the difference in the dependent variables.
- Any of the changes in the weather on the day on which the data is going to be collected can make the changes in the performance of the race walkers.
- Any of the energy-providing beverages taken during the race walk can change or improve the recovery of race walkers.

## HYPOTHESIS OF THE STUDY

It is hypothesised that there will be a statistically significant difference of the Recovery drink on the recovery pattern on the selected parameters of the Race walkers"

## DEFINITIONS AND EXPLANATION OF THE TERMS

- **Race walking-** Race walking is highly technical and very different to running because one foot must be in contact with the ground at all times. Failure to do so is known as 'lifting'.

  The rules also state that the advancing leg must straighten from the point of contact with the ground and remain straight until the body passes over it. Judges inspect the race and carry paddles with symbols for loss of contact and bent knee.

  If a race walker is shown three warnings (paddles) from different judges, including the chief judge, it leads to disqualification. In some race walking events, a pit lane will be in use, and athletes will serve a two-minute time penalty if given three warnings. A red paddle is shown to a disqualified athlete. The race order is determined by time.

- **Energy drinks** are beverages that are marketed to enhance performance and boost energy. These usually contain various quantities of sugars, caffeine, guarana, taurine, ginseng and other proprietary ingredients.
- **Recovery drinks**- Recovery drinks are different from energy drinks because the athlete will ingest a recovery drink after exercising rather than before exercising.

## SIGNIFICANCE OF THE STUDY

- The significance of the present study is going to tell the race walkers that the recovery drink is helpful in faster recovery.
- The significance of the present study is to help determine the approximate amount of carbohydrates and protein required for recovery from the post-workout DOMS (delayed onset of muscle soreness).

## RESEARCH QUESTION

- What could be the right ratio of carbohydrates and proteins in a recovery drink based on this present study, we can suggest to the coaches of the race walkers.

# Chapter- II

# REVIEW OF RELATED LITERATURE

1. **(Pritchett & Pritchett, 2012)** An optimal post-exercise nutrition regimen is fundamental for ensuring recovery. Therefore, research has aimed to examine post-exercise nutritional strategies for enhanced training stimuli. Chocolate milk has become an affordable recovery beverage for many athletes, taking the place of more expensive commercially available recovery beverages. Low-fat chocolate milk consists of a 4:1 carbohydrate: protein ratio (similar to many commercial recovery beverages) and provides fluids and sodium to aid in post-workout recovery. Consuming chocolate milk ($1.0–1.5 \cdot g \cdot kg^{-1}\ h^{-1}$) immediately after exercise and again at 2 h post-exercise appears to be optimal for exercise recovery and may attenuate indices of muscle damage. Future research should examine the optimal amount, timing, and frequency of ingestion of chocolate milk on post-exercise recovery measures including performance, indices of muscle damage, and muscle glycogen resynthesis.

2. **(Saunders, 2011)** Postexercise carbohydrate intake has been shown to augment recovery from heavy aerobic exercise. The effects of carbohydrate and protein congestion (CHO + Pro) have been investigated more recently, including the potential influences of chocolate milk. Some studies report that CHO + Pro beverages (including chocolate milk) enhance subsequent exercise performance versus carbohydrate beverages, although others have reported no positive effects. The putative efficacy of CHO + Pro could be due to influences on glycogen resynthesis, protein turnover, rehydration, attenuations in muscle disruption, or perhaps a combination of these factors. However, there are inconsistencies in the literature regarding the effects of CHO + Pro on these factors, and the mechanisms explaining potential influences of CHO + Pro are not defined clearly. Further research is required to address these limitations, but present evidence suggests that CHO + Pro beverages may positively influence recovery under some exercise conditions, and chocolate milk is likely a good recovery beverage for lactose-tolerant endurance athletes.

3. **(Osterberg et al., 2008)** Carbohydrate intake during endurance exercise delays the onset of fatigue and improves performance. Two recent cycling studies have reported increased time to exhaustion when protein is ingested together with carbohydrate. The purpose of the present study was to test the hypothesis that ingestion of a

carbohydrate + protein beverage will lead to significant improvements in cycling time-trial performance relative to placebo and carbohydrate alone. Thirteen cyclists completed 120 min of constant-load ergometer cycling. Thereafter, participants performed a time-trial in which they completed a set amount of work (7 $kJ \cdot kg^{-1}$) as quickly as possible. Participants completed four experimental trials, the first for familiarization and then three randomized, double-blind treatments consisting of a placebo, carbohydrate, and carbohydrate + protein. Participants received 250 ml of beverage every 15 min during the constant-load ride. Time-trial performance for carbohydrate (37.1 min, $s = 3.8$) was significantly ($P < 0.05$) faster than placebo (39.7 min, $s = 4.6$). Time-trial performance for carbohydrate + protein (38.8 min, $s = 5.5$) was not significantly different from either placebo or carbohydrate. Ingestion of a carbohydrate beverage during two hours of constant-load cycling significantly enhanced subsequent time-trial performance compared with placebo. The carbohydrate + protein beverage provided no additional performance benefit.

4. **(Karp et al., 2006)** Nine male, endurance-trained cyclists performed an interval workout followed by 4 h of recovery, and a subsequent endurance trial to exhaustion at 70% $VO_{2max}$, on three separate days. Immediately following the first exercise bout and 2 h of recovery, subjects drank isovolumic amounts of chocolate milk, fluid replacement drink (FR), or carbohydrate replacement drink (CR), in a single-blind, randomized design. Carbohydrate content was equivalent for chocolate milk and CR. Time to exhaustion (TTE), average heart rate (HR), rating of perceived exertion (RPE), and total work ($W_T$) for the endurance exercise were compared between trials. TTE and $W_T$ were significantly greater for chocolate milk and FR trials compared to CR trial. The results of this study suggest that chocolate milk is an effective recovery aid between two exhausting exercise bouts.

5. **(Kim et al., 2016)** Abstract Exercise-induced rhabdomyolysis (exRML), a pathophysiological condition of skeletal muscle cell damage that may cause acute renal failure and in some cases death. Increased Ca2+ level in cells along with functional degradation of cell signaling system and cell matrix have been suggested as the major pathological mechanisms associated with exRML. The onset of exRML may be exhibited in athletes as well as in general population. Previous studies have reported

that possible causes of exRML were associated with excessive eccentric contractions in high temperature, abnormal electrolytes balance, and nutritional deficiencies possible genetic defects. However, the underlying mechanisms of exRML have not been clearly established among health professionals or sports medicine personnel. Therefore, we reviewed the possible mechanisms and correlated prevention of exRML, while providing useful and practical information for the athlete and general exercising population. © 2016 Production and hosting by Elsevier B.V. on behalf of Shanghai University of Sport.

6. **(Wagner et al., 2015)** To present the case of recurrent rhabdomyolysis in an active female. Background: A healthy 21-year-old female developed severe fatigue and peripheral edema in the upper extremities after an extreme exercise workout session. 4 ½ months later she participated in a similar exercise session with a personal trainer and experienced the same symptoms. Differential Diagnosis: In the initial case, upon physical examination and review of blood work a diagnosis of rhabdomyolysis was made. After the second exercise session athlete was diagnosed with recurrent rhabdomyolysis and was advised to seek treatment at the local emergency room. Treatment: In the initial case the athlete was told by medical personnel to increase fluid intake and rest. In the second case athlete was treated at the emergency room with IV fluids. Uniqueness: The athlete was female, and most cases of rhabdomyolysis occur in males. Athlete was treated for rhabdomyolysis and recurrent rhabdomyolysis; however, these diagnoses were made 4 ½ months apart. Also, both cases appear to be the result of the same type of exercise session. Conclusion: There does not appear to be a definitive protocol for an accurate diagnosis of rhabdomyolysis. Guidelines for return to activity should be evaluated on a case-by-case basis, and a conservative increase in intensity of exercise is warranted to prevent a case of recurrent rhabdomyolysis.

7. **(Totsuka et al., 2002)** Break point of serum creatine kinase release after endurance exercise. *J Appl Physiol* 93: 1280 – 1286, 2002; 10.1152/japplphysiol. 01270.2001.— We investigated whether there is a break point of creatine kinase (CK) release after daily endurance exercise and whether CK response depends on individual physical characteristics. Fifteen healthy young men performed 90 min of bicycle exercise for 3

consecutive days. Body composition, properties of the quadriceps femoris muscle (QFM), and aerobic and anaerobic capacities were estimated before the test. Blood samples were obtained 22 times during the experimental period. Endurance exercise significantly elevated serum CK from 3 h after the first exercise session ($P$ 0.05) and gradually increased thereafter. Subjects were classified into two groups according to their peak CK values: high responders (HR; 500 IU/l of CK) and low responders (LR; 300 IU/l of CK). Peak CK values during the experimental period correlated ($P$ >0.01) with workload/cross-sectional area of the QFM ($r$ 0.658), workload/volume of the QFM ($r$ 0.648), and knee extensor strength/body mass ($r$ 0.634); however, the HR and LR groups were separated in each variable. Thus the break point of CK release after endurance exercises under these conditions is 300–500 IU/l, two or three times higher than in the resting condition, and is associated with properties of the QFM.

# Chapter- III

# PROCEDURE AND METHODOLOGY

## PROCEDURE

In the third chapter, we will check out how the procedure of the whole research work will be conducted. This can be treated as most important chapter in the synopsis and it can be treated as the backbone of the research work because it tells us how we will be collecting the data with the help of research design and use the suitable statistical technique which is going to be used.

## SELECTION OF THE SUBJECTS

The participants who will be selected for the present study are those race walkers who have participated in the National-level race-walking events organized by the Indian Athletics Federation.

## SELECTION OF THE VARIABLES

Independent variable- Recovery drink

Dependent variable-

- Blood Lactate
- Blood glucose level
- Lactate Dehydrogenase
- Heart rate
- Rating of Perceived Exertion
- Sleep quality

## CRITERION MEASURE

| S. NO. | VARIABLE | TESTING INSTRUMENT | CRITERION MEASURE |
|---|---|---|---|
| 1. | Blood lactate | Lacto Spark by sensa core | mmol./litre (mili-moles per litre) |
| 2. | Blood glucose level | Gluco Spark by sensa core | mg/dl. |
| 3. | Lactate Dehydrogenase | Blood test by Pathologist | U/L |
| 4 | Rating of perceived Exertion | Rating of Perceived Exertion Questionnaire | Borg's Scale |
| 5 | Heart rate | Palpation testing | Beats/minutes |
| 6 | Sleep quality | Athlete Sleep Screening Questionnaire | Bender A.M., Lawson D., Werthner P., et al. |

## PROCEDURE OF TESTING AND COLLECTION OF DATA

Data will be collected on two different time frames, first when the recovery drink is not given to the race walkers, they will only use normal water for the whole session and second when the recovery drink is given to the race walkers.

**DATA COLLECTED WHEN THE RECOVERY DRINK IS NOT GIVEN**

| VARIABLES | PRE | POST 15 MINUTES | POST 30 MINUTES | POST 45 MINUTES |
|---|---|---|---|---|
| BLOOD LACTATE | ✓ | ✓ | ✓ | ✓ |
| BLOOD GLUCOSE | ✓ | ✓ | ✓ | ✓ |
| HEART RATE | ✓ | ✓ | ✓ | ✓ |
| LACTATE DEHYDROGENASE | **X** | **X** | **X** | ✓ |
| RATING OF PERCEIVED EXERTION | **X** | **X** | **X** | ✓ |
| SLEEP QUALITY | **X** | **X** | **X** | ✓ |

**DATA COLLECTED WHEN THE RECOVERY DRINK IS GIVEN**

| VARIABLES | PRE | POST 15 MINUTES | POST 30 MINUTES | POST 45 MINUTES |
|---|---|---|---|---|
| BLOOD LACTATE | ✓ | ✓ | ✓ | ✓ |
| BLOOD GLUCOSE | ✓ | ✓ | ✓ | ✓ |
| HEART RATE | ✓ | ✓ | ✓ | ✓ |
| LACTATE DEHYDROGENASE | **X** | **X** | **X** | ✓ |
| RATING OF PERCEIVED EXERTION | **X** | **X** | **X** | ✓ |
| SLEEP QUALITY | **X** | **X** | **X** | ✓ |

* Note- the recovery time will start from every individual's respective finishing time.

# STATISTICAL TECHNIQUE

- Descriptive statistics, mean, and standard deviation will be used in this study
- The statistical technique which we will use for this study will be one-way repeated measure Anova for the variables Blood Lactate, Blood Glucose, and Heart Rate.
- Paired sample t-test will be used for the comparison of variables rating of perceived Exertion, Lactate Dehydrogenase and sleep quality.

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